OIPE JC63
JAN 2 9 2002
PATENT & TRADEMARK OFFICE

SEQUENCE LISTING

<110> Pecker, Iris

Vlodavsky , Israel

Feinstein, Elena

<120> POLYNUCLEOTIDE ENCODING A POLYPEPTIDE HAVING HEPARANASE ACTIVITY AND EXPRESSION OF SAME IN GENETICALLY MODIFIED CELLS

<130> 01/22781

<150> US 09/776,874

<151> 2001-02-06

<150> US09/258,892

<151> 1999-03-01

<150> PCT/US98/17954

<151> 1998-08-31

<150> US 09/109,386

<151> 1998-07-02

<150> US 08/922,170

<151> 1997-09-02

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<170> PatentIn version 3.1

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Leu Ala Thr Asp Pro Arg Phe Leu Ile Leu Leu Gly Ser Pro Lys Leu
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Arg Thr Leu Ala Arg Gly Leu Ser Pro Ala Tyr Leu Arg Phe Gly Gly
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Asp Tyr Cys Ser Ser Lys Gly Tyr Asn Ile Ser Trp Glu Leu Gly Asn
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Glu Pro Asn Ser Phe Leu Lys Lys Ala Asp Ile Phe Ile Asn Gly Ser
225                 230                 235                 240

Gln Leu Gly Gln Asp Tyr Ile Gln Leu His Lys Leu Leu Arg Lys Ser
                245                 250                 255

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Ser Thr Asn Gln Arg Phe Leu Asn Pro Asp Val Leu Arg Ile Phe Ile
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Ser Ser Val Gln Lys Val Phe Gln Val Val Glu Ser Thr Arg Pro Gly
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Lys Lys Val Trp Leu Gly Glu Thr Ser Ser Ala Tyr Gly Gly Gly Ala
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Pro Leu Leu Ser Asp Thr Phe Ala Ala Gly Phe Met Trp Leu Asp Lys
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Leu Gly Leu Ser Ala Arg Met Gly Ile Glu Val Val Met Arg Gln Val
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Phe Phe Gly Ala Gly Asn Tyr His Leu Val Asp Glu Asn Phe Asp Pro
385                 390                 395                 400

Leu Pro Asp Tyr Trp Leu Ser Leu Leu Phe Lys Lys Leu Val Gly Thr
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Lys Val Leu Met Ala Ser Val Gln Gly Ser Lys Arg Arg Lys Leu Arg
            420                 425                 430

Val Tyr Leu His Cys Thr Asn Thr Asp Asn Pro Arg Tyr Lys Glu Gly
        435                 440                 445

Asp Leu Thr Leu Tyr Ala Ile Asn Leu His Asn Val Thr Lys Tyr Leu
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Arg Leu Pro Tyr Pro Phe Ser Asn Lys Gln Val Asp Lys Tyr Leu Leu
465                 470                 475                 480

Arg Pro Leu Gly Pro His Gly Leu Leu Ser Lys Ser Val Gln Leu Asn
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Gly Leu Thr Leu Lys Met Val Asp Asp Gln Thr Leu Pro Pro Leu Met
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Glu Lys Pro Leu Arg Pro Gly Ser Ser Leu Gly Leu Pro Ala Phe Ser
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Leu Leu Leu Gly Pro Leu Gly Pro Leu Ser Pro Gly Ala Leu Pro Arg
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ccg ctg cac ctg gtg agc ccc tcg ttc ctg tcc gtc acc att gac gcc       251
Pro Leu His Leu Val Ser Pro Ser Phe Leu Ser Val Thr Ile Asp Ala
        50                  55                  60

aac ctg gcc acg gac ccg cgg ttc ctc atc ctc ctg ggt tct cca aag       299
Asn Leu Ala Thr Asp Pro Arg Phe Leu Ile Leu Leu Gly Ser Pro Lys
    65                  70                  75

ctt cgt acc ttg gcc aga ggc ttg tct cct gcg tac ctg agg ttt ggt       347
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80                  85                  90                  95

ggc acc aag aca gac ttc cta att ttc gat ccc aag aag gaa tca acc       395
Gly Thr Lys Thr Asp Phe Leu Ile Phe Asp Pro Lys Lys Glu Ser Thr
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aaa tat gga tcc atc cct cct gat gtg gag gag aag tta cgg ttg gaa       491
Lys Tyr Gly Ser Ile Pro Pro Asp Val Glu Glu Lys Leu Arg Leu Glu
        130                 135                 140

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Trp Pro Tyr Gln Glu Gln Leu Leu Leu Arg Glu His Tyr Gln Lys Lys
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tcg cag tta gga gaa gat tat att caa ttg cat aaa ctt cta aga aag       827
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gaa gtg att gat tca gtt aca tgg cat cac tac tat ttg aat gga cgg       971
Glu Val Ile Asp Ser Val Thr Trp His His Tyr Tyr Leu Asn Gly Arg
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Thr Ala Thr Arg Glu Asp Phe Leu Asn Pro Asp Val Leu Asp Ile Phe
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Lys Met Leu Leu Arg Ser Lys Pro Ala Leu Pro Pro Pro Leu Met Leu
    50                  55                  60

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Pro Leu His Leu Val Ser Pro Ser Phe Leu Ser Val Thr Ile Asp Ala
            100                 105                 110

Asn Leu Ala Thr Asp Pro Arg Phe Leu Ile Leu Leu Gly Ser Pro Lys
        115                 120                 125

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Phe Glu Glu Arg Ser Tyr Trp Gln Ser Gln Val Asn Gln Asp Ile Cys
                165                 170                 175

Lys Tyr Gly Ser Ile Pro Pro Asp Val Glu Glu Lys Leu Arg Leu Glu
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Trp Pro Tyr Gln Glu Gln Leu Leu Leu Arg Glu His Tyr Gln Lys Lys
        195                 200                 205

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    210                 215                 220

Phe Ala Asn Cys Ser Gly Leu Asp Leu Ile Phe Gly Leu Asn Ala Leu
225                 230                 235                 240

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325 330 335

Glu Val Ile Asp Ser Val Thr Trp His His Tyr Tyr Leu Asn Gly Arg
340 345 350

Thr Ala Thr Arg Glu Asp Phe Leu Asn Pro Asp Val Leu Asp Ile Phe
355 360 365

Ile Ser Ser Val Gln Lys Val Phe Gln Val Val Glu Ser Thr Arg Pro
370 375 380

Gly Lys Lys Val Trp Leu Gly Glu Thr Ser Ser Ala Tyr Gly Gly Gly
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Pro Leu Pro Asp Tyr Trp Leu Ser Leu Leu Phe Lys Lys Leu Val Gly
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                                     1               5

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    25                  30                  35

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Trp Arg Gly Glu Gln Pro Gly Glu Pro Lys Met Leu Leu Arg Ser Lys
40                  45                  50                  55

cct gcg ctg ccg ccg ccg ctg atg ctg ctg ctc ctg ggg ccg ctg ggt       306
Pro Ala Leu Pro Pro Pro Leu Met Leu Leu Leu Leu Gly Pro Leu Gly
                60                  65                  70

ccc ctc tcc cct ggc gcc ctg ccc cga cct gcg caa gca cag gac gtc       354
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            75                  80                  85

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Val Asp Leu Asp Phe Phe Thr Gln Glu Pro Leu His Leu Val Ser Pro
        90                  95                  100

tcg ttc ctg tcc gtc acc att gac gcc aac ctg gcc acg gac ccg cgg       450
Ser Phe Leu Ser Val Thr Ile Asp Ala Asn Leu Ala Thr Asp Pro Arg
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Phe Leu Ile Leu Leu Gly Ser Pro Lys Leu Arg Thr Leu Ala Arg Gly
120                 125                 130                 135

ttg tct cct gcg tac ctg agg ttt ggt ggc acc aag aca gac ttc cta       546
Leu Ser Pro Ala Tyr Leu Arg Phe Gly Gly Thr Lys Thr Asp Phe Leu
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Asp Val Glu Glu Lys Leu Arg Leu Glu Trp Pro Tyr Gln Glu Gln Leu
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cta ctc cga gaa cac tac cag aaa aag ttc aag aac agc acc tac tca        738
Leu Leu Arg Glu His Tyr Gln Lys Lys Phe Lys Asn Ser Thr Tyr Ser
200                 205                 210                 215

aga agc tct gta gat gtg cta tac act ttt gca aac tgc tca gga ctg        786
Arg Ser Ser Val Asp Val Leu Tyr Thr Phe Ala Asn Cys Ser Gly Leu
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gac ttg atc ttt ggc cta aat gcg tta tta aga aca gca gat ttg cag        834
Asp Leu Ile Phe Gly Leu Asn Ala Leu Leu Arg Thr Ala Asp Leu Gln
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tgg aac agt tct aat gct cag ttg ctc ctg gac tac tgc tct tcc aag        882
Trp Asn Ser Ser Asn Ala Gln Leu Leu Leu Asp Tyr Cys Ser Ser Lys
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ggg tat aac att tct tgg gaa cta ggc aat gaa cct aac agt ttc ctt        930
Gly Tyr Asn Ile Ser Trp Glu Leu Gly Asn Glu Pro Asn Ser Phe Leu
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aag aag gct gat att ttc atc aat ggg tcg cag tta gga gaa gat tat        978
Lys Lys Ala Asp Ile Phe Ile Asn Gly Ser Gln Leu Gly Glu Asp Tyr
280                 285                 290                 295

att caa ttg cat aaa ctt cta aga aag tcc acc ttc aaa aat gca aaa       1026
Ile Gln Leu His Lys Leu Leu Arg Lys Ser Thr Phe Lys Asn Ala Lys
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ctc tat ggt cct gat gtt ggt cag cct cga aga aag acg gct aag atg       1074
Leu Tyr Gly Pro Asp Val Gly Gln Pro Arg Arg Lys Thr Ala Lys Met
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ctg aag agc ttc ctg aag gct ggt gga gaa gtg att gat tca gtt aca       1122
Leu Lys Ser Phe Leu Lys Ala Gly Gly Glu Val Ile Asp Ser Val Thr
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Trp His His Tyr Tyr Leu Asn Gly Arg Thr Ala Thr Arg Glu Asp Phe
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Phe Gln Val Val Glu Ser Thr Arg Pro Gly Lys Lys Val Trp Leu Gly
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gaa acc agc tct gca tat gga ggc gga gcg cct ttg cta tct gac acc       1314
Glu Thr Ser Ser Ala Tyr Gly Gly Gly Ala Pro Leu Leu Ser Asp Thr
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Phe Ala Ala Gly Phe Met Trp Leu Asp Lys Leu Gly Leu Ser Ala Arg
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atg gga ata gaa gtg gtg atg agg caa gta ttc ttt gga gca gga aac       1410
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Ile Asn Leu His Asn Val Thr Lys Tyr Leu Arg Leu Pro Tyr Pro Phe
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Val Asp Asp Gln Thr Leu Pro Pro Leu Met Glu Lys Pro Leu Arg Pro
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Thr Phe Leu Gly Ser Pro Arg Leu Arg Ala Leu Ala Arg Gly Leu Ser
65                  70                  75                  80

Pro Ala Tyr Leu Arg Phe Gly Gly Thr Lys Thr Asp Phe Leu Ile Phe
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Asp Pro Asp Lys Glu Pro Thr Ser Glu Glu Arg Ser Tyr Trp Lys Ser
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Gln Val Asn His Asp Ile Cys Arg Ser Glu Pro Val Ser Ala Ala Val
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Leu Arg Lys Leu Gln Val Glu Trp Pro Phe Gln Glu Leu Leu Leu Leu
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Arg Glu Gln Tyr Gln Lys Glu Phe Lys Asn Ser Thr Tyr Ser Arg Ser
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225                 230                 235                 240

Leu His Lys Leu Leu Gln Arg Ser Ala Phe Gln Asn Ala Lys Leu Tyr
                245                 250                 255

Gly Pro Asp Ile Gly Gln Pro Arg Gly Lys Thr Val Lys Leu Leu Arg
            260                 265                 270

Ser Phe Leu Lys Ala Gly Gly Glu Val Ile Asp Ser Leu Thr Trp His
        275                 280                 285

His Tyr Tyr Leu Asn Gly Arg Ile Ala Thr Lys Glu Asp Phe Leu Ser
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Ser Asp Ala Leu Asp Thr Phe Ile Leu Ser Val Gln Lys Ile Leu Lys
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Val Thr Lys Glu Ile Thr Pro Gly Lys Lys Val Trp Leu Gly Glu Thr
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Ser Ser Ala Tyr Gly Gly Gly Ala Pro Leu Leu Ser Asn Thr Phe Ala
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Ala Gly Phe Met Trp Leu Asp Lys Leu Gly Leu Ser Ala Gln Met Gly
        355                 360                 365

Ile Glu Val Val Met Arg Gln Val Phe Phe Gly Ala Gly Asn Tyr His
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Leu Val Asp Glu Asn Phe Glu Pro Leu Pro Asp Tyr Trp Leu Ser Leu
385                 390                 395                 400

Leu Phe Lys Lys Leu Val Gly Pro Arg Val Leu Leu Ser Arg Val Lys
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Gly Pro Asp Arg Ser Lys Leu Arg Val Tyr Leu His Cys Thr Asn Val
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Tyr His Pro Arg Tyr Gln Glu Gly Asp Leu Thr Leu Tyr Val Leu Asn
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Phe Leu Gly Ser Pro Arg Leu Arg Ala Leu Ala Arg Gly Leu Ser Pro
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aca tac ttg aga ttt ggc ggc aca aag act gac ttc ctt att ttt gat         884
Ala Tyr Leu Arg Phe Gly Gly Thr Lys Thr Asp Phe Leu Ile Phe Asp
            85                  90                  95

ccg gac aag gaa ccg act tcc gaa gaa aga agt tac tgg aaa tct caa         932
Pro Asp Lys Glu Pro Thr Ser Glu Glu Arg Ser Tyr Trp Lys Ser Gln
        100                 105                 110

gtc aac cat gat att tgc agg tct gag ccg gtc tct gct gcg gtg ttg         980
Val Asn His Asp Ile Cys Arg Ser Glu Pro Val Ser Ala Ala Val Leu
    115                 120                 125

agg aaa ctc cag gtg gaa tgg ccc ttc cag gag ctg ttg ctg ctc cga        1028
Arg Lys Leu Gln Val Glu Trp Pro Phe Gln Glu Leu Leu Leu Leu Arg
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gag cag tac caa aag gag ttc aag aac agc acc tac tca aga agc tca        1076
Glu Gln Tyr Gln Lys Glu Phe Lys Asn Ser Thr Tyr Ser Arg Ser Ser
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Val Asp Met Leu Tyr Ser Phe Ala Lys Cys Ser Gly Leu Asp Leu Ile
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Phe Gly Leu Asn Ala Leu Leu Arg Thr Pro Asp Leu Arg Trp Asn Ser
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tcc aac gcc cag ctt ctc ctt gac tac tgc tct tcc aag ggt tat aac        1220
Ser Asn Ala Gln Leu Leu Leu Asp Tyr Cys Ser Ser Lys Gly Tyr Asn
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Ile Ser Trp Glu Leu Gly Asn Glu Pro Asn Ser Phe Trp Lys Lys Ala
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His Ile Leu Ile Asp Gly Leu Gln Leu Gly Glu Asp Phe Val Glu Leu
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His Lys Leu Leu Gln Arg Ser Ala Phe Gln Asn Ala Lys Leu Tyr Gly
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Phe Leu Lys Ala Gly Gly Glu Val Ile Asp Ser Leu Thr Trp His His
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Pro Asp Arg Ser Lys Leu Arg Val Tyr Leu His Cys Thr Asn Val Tyr
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His Pro Arg Tyr Gln Glu Gly Asp Leu Thr Leu Tyr Val Leu Asn Leu
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cat aat gtc acc aag cac ttg aag gta ccg cct ccg ttg ttc agg aaa       1988
His Asn Val Thr Lys His Leu Lys Val Pro Pro Pro Leu Phe Arg Lys
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Gln Thr Leu Pro Ala Leu Thr Glu Lys Pro Leu Pro Ala Gly Ser Ala
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Lys Ile Ala Ala Cys Ile
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c 541